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A Framework for Classifying and Comparing Interactions in Cultural Heritage Information Systems

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Abstract:
With the mass digitization of cultural heritage and the increase of people accessing the digitized memory objects, it becomes crucial to develop meaningful interaction patterns in cultural heritage information systems. This explorative study is based on an investigation of 50 websites from the cultural heritage domain. It derives a framework for classifying user interactions with digital cultural heritage. The framework has two dimensions; the first one is a classification of the interactions and the second one describes their degree of complexity. The strength of this framework is the ability to compare complexity, scope and purpose of interactions across different websites while offering a meaningful vocabulary for discussing different interaction features.

1. Introduction

For centuries, cultural heritage institutions have acted as guardians of the society's cultural memory, guiding visitors and researchers through historic and contemporary assets while explaining their significance and value. Through digitization of cultural heritage and online access to it, memory institutions such as museums, libraries and archives have the opportunity to unlock the potential of their material. Recent technological developments enable organizations to reach a broad spectrum of people with different backgrounds and to facilitate contextualization of cultural heritage artifacts in an unprecedented way, thus opening up new horizons in experiencing cultural heritage.

Most institutions seized the opportunity to revive their hidden heritage by digitizing objects and publishing and displaying a digital surrogate on a

website or information system. They seek meaningful presentations of their digitized cultural heritage data with regard to display of context and purposeful interactions, but transferring context and significance of objects in a digital environment is not a trivial task. In most cases, the digital representations do not reflect the context the original artifacts were embedded in. This leads to a loss of meaningful and often costly-curated information and the question what purposeful interactions with digital cultural heritage should entail.

Cultural heritage information systems need to be differentiated from systems accessing pure textual content. The main differences between a generic information system and one storing and accessing cultural heritage are the potential interactions with the digital content. First, the information system needs to offer appropriate access functionalities that bring meaningful objects to the surface and ensure important information does not get buried in a pile of low quality metadata. Second, they need to enable the users to immerse themselves in the historic situation an object gained significance from and make clear in which context it was created. In the best case, context and digital objects are so interweaved that they transport the user back in time simulating the historic setting. Presenting and showcasing cultural heritage and striving for enthusing users about their heritage through the means of the digital medium should be the goal of memory institutions.

One might consider these dreams of the future, because a lot of steps need to be taken for this vision to become reality. Defining purposeful interactions with cultural heritage online and giving users guidance to explore new functionalities in experiencing digital artifacts are certainly one of the most important aspects memory institutions should take into account. It becomes essential to identify the potential benefits of displaying and providing cultural heritage in a digital medium with its unique affordances allowing for different interactions than the ones commonly practiced with physical objects (Murray, 2011). The goal is to build systems for interacting with memory artifacts that are open to evolve and can adapt to interaction and usage patterns that are not yet foreseeable. Many recently developed cultural heritage information

systems are lacking a strategy for user involvement and purpose of such an engagement.

This chapter[1] deals with the strategies of cultural institutions to provide users with means for purposeful interactions with digital cultural heritage while maintaining their mandate to offer universal access to curated content. It presents a conclusive framework to evaluate interactions and to critically analyze them with regard to serving users and cultural institutions alike. This systematic approach supports the assessment of interactions with digital cultural heritage in their entirety. The objective is to share insights about the nature of purposeful interactions in this domain and strategically improve and enhance them to serve the needs of institutions while being open for future developments and use cases. A particular focus will be on aggregators, especially Europeana[2], and their interactions. They often accumulate material from libraries, museums and archives and serve as good examples for cultural heritage information systems.

2. Defining Interactions in Cultural Heritage Information Systems

In contrast to natural heritage, cultural heritage consists of objects created or interpreted by humans. These objects are products, which inherit a purpose and are defined by their use (Bearman & Trant, 2002). Intangible objects such as dances or language explicitly extend this definition.

Recently, the shift of memory institutions from being gatekeepers to becoming facilitators and mediators of knowledge exchange (Freedman, 2000) involves complementing cultural artifacts with digital surrogates and their metadata in information systems. Cultural heritage information systems collect, organize and display cultural heritage objects including their metadata in a digital

[1] This chapter is extracted and adapted from Stiller, Juliane (2014): From Curation to Collaboration. A Framework for Interactions in Cultural Heritage Information Systems. Doctoral thesis. Humboldt-Universität zu Berlin. Available at: http://edoc.hu-berlin.de/dissertationen/stiller-juliane-2014-02-13/PDF/stiller.pdf

[2] www.europeana.eu

environment providing information about the contextual background of the object (Petras et al, 2013). This requires the information system to offer interactions that go beyond the common known-item search experience accommodating contextualization and collaboration.

Interactions are a crucial component in the architecture of an information system. Here, the view of human-computer interaction and interaction design (e.g. Cooper et al 2007, Rogers et al, 2011) is adopted to define the concept*:* an *interaction* includes one or more actions a user can complete in a cultural heritage information system such as searching or browsing items. It also describes actions that support collaborative engagements, for example editing a user profile, uploading objects and creating collections. In the foreground of this definition is the underlying purpose of the action that is taken by a user.

For digital libraries, not only users interact with the system but also the system components interact with other layers of the system. Bates' model of cascading layers of interactions suggests that each strategic part influences the design of the following component. On their basic level, digital libraries consist of content and a database to organize it. The last part in this model consists of the user's expectations and interactions with the system (Bates, 2002). A much more simplified model derived from Bates' assumptions determines that every information system (also outside the cultural heritage domain) strives for seamless interactions between the users and the content. The layers in between - on the one hand the system which enables access to the content in all its facets and on the other hand the interaction patterns and interface functionalities which enable the user to interact - should be transparent and intuitive to the user. Figure 8.1 illustrates this simplified model. Murray (2011, p. 10) calls this concept *transparent*, meaning that the interface should not distract the users from their tasks offering them interactions they can intuitively execute.

User interactions with the content are based upon and support the different access modes a system provides. These can be broadened and further

enriched by the user who creates more access points. From a generic perspective, interactions with the system provide access to information encompassing all aspects from finding a resource and using it to making sense of it. Information access consists of three main modes - *Search*, *Browse* and *Engage* - which are similarly described in Petras et al. (2013):

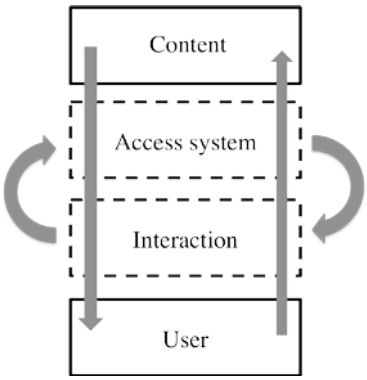

Figure 8.1: Simplified model of an ideal information system

Search: In most information systems, search is the most important access mode. It can be defined as a bundle of techniques and methods to identify relevant documents, which are likely to satisfy a user's information need (Agosti, 2008). The user interacts with the content of an information system by inputting a query into a search box. It is an access mode characterized by interactions to find the objects users are looking for. It includes all interactions that help support the users in retrieving facts and objects that match their input, such as a query. Search is an access mode that can be further broadened through interactions of users creating more points of access.

Browse /Explore: Browse is considered to be an access mode that is distinguished from Search as it does not require a query to find information or get a general idea about the collection or offered items in an information system. Browsing is often described as being cognitively easier to perform than searching with a query and retrieving relevant results from a list (*recognition over recall paradigm*) (Hearst, 2009, p.74, but also Cove & Welsh, 1988). Through user interactions, structuring and grouping data can be introduced easily. This requires more interaction opportunities in a system than a simple search box. But often new structures and contextual groupings

of the data unfold once users interact with a system. Compared to Search, Browse presumes more complex interactions. In return, these interactions create more access points to the material.

Engage: Engage is the most complex access mode which encompasses interactions that are not based on pure consumption such as searching and browsing. When searching or browsing, the user consumes information items as provided by the information system. If users interact with an information system's content in the engage access mode, they edit existing content or add new content collaboratively with others or alone (Frieseke et al, 2011, p. 18). How cultural heritage institutions deal with user-contributed data and use it to engage users on the one hand and enrich their content on the other will be the key factor determining the success of their information systems. They will be judged by their ability to maintain a discourse involving experts and novice users about cultural material that excels in quality and relevance (Proctor, 2010).

The new approach presented here links the modes of access, Search, Browse and Engage to the interactions offered by a system. The access to information and cultural heritage content is influenced by the interactions and their ability to create valuable access points. The interrelatedness between interactions and access modes is the basis for the development of the framework of interactions introduced in the next section.

3. A Framework of Interactions

The framework of interactions in cultural heritage information systems combines a categorization of interactions with their degree and their interplay with the access modes[3]. It is a means to express complexity and variability of interactions in a system in relation to the modes of access it provides. It enables comparison and evaluation of interactions in cultural heritage

[3] An earlier version of the framework appeared in: Stiller, Juliane: A Framework for Classifying Interactions in Cultural Heritage Information Systems. In: International Journal of Heritage ib the Digital Era. Proceedings of Euromed 2012: Progress in Cultural Heritage Preservation, 1, p. 141-146.

information systems. The framework offers the opportunity to assess systems from a different perspective deriving new insights on how system design influences access points.

The framework was developed based on a review of 50 cultural heritage information systems analyzing the interaction features and interaction patterns that were found in this sample. The framework consists of two dimensions. The first dimension is a taxonomy that allows all user interactions within the system to be systematized into different interaction classes. The second dimension describes the complexity within a class and its relation to the different access modes.

3.1 Categorizing Interactions

In a first step, the different interactions and interaction patterns found in the sample information systems were clustered into groups. By analyzing these interactions, different classes of interactions emerged. The classes spanned by meta-classes form the first dimension of the framework creating a taxonomy of common interaction patterns in cultural heritage information systems:

Content interaction meta-class: The content is the basis of an information system and guides its design and functionalities. In cultural heritage information systems, either the institution or the user provides content. Interactions with content aim at discovery through search or browsing, deep-zooming into pictures or paging through a curated online exhibition. The content's origin is often reflected in the interactions offered with it.

Curation interaction meta-class: Curation can be institutional or applied by the user. Institutional curation is often applied prior to feeding the objects into the information systems, e.g. through acquisition of an object. This type of curation is usually carried out in the information system, but users can interact with its results, for example curated exhibitions. The user-driven interactions are characterized by the customized and personalized way in which the user

can experience the digital cultural heritage material. The goal is to involve users on the one hand and to contextualize the digital material by engaging a user or a group of like-minded people on the other.

Support interaction meta-class: To offer a meaningful and sustainable system with a rich user experience, some supporting interactions are necessary. They are often neglected as they revolve around user management and user identities. They invite the user to revisit a particular systems and identify with its content. The *Support* classes take the *Curation* interactions to the next level, engaging the user and providing incentives to contribute and visit regularly. These interactions make the experience in a cultural heritage information system meaningful and sustainable.

The interaction classes described above are interrelated. Curation classes are not possible without Support classes, and the content is just a lifeless structure without any activities targeted towards interacting with it. Table 8.1 shows the taxonomy of interactions with a detailed description of every class and the interactions which were clustered in these classes.

Table 8.1: Classes of interactions with descriptions of the interaction patterns.

Meta-Class	**Class**	**Description of the clustered interaction patterns**
Content	Institutional Objects	Interaction patterns related to the institutional content aggregated in information systems. Examples are searching full-text, looking at a full-view item or browsing thematic exhibitions.
	User Objects	Same as above, but the content is user-provided, therefore different functionalities are applied such as upload features.
Curation	Annotations	Interaction patterns that allow users to add additional information to content, such as writing comments, tagging or other free text. It also includes the linking of other digital objects to existing content.

	User Exhibition	Interaction patterns that allow users to curate customized exhibitions and collections of content.
	Storytelling	Interaction patterns that allow users to add their own point of view through directed and chronological narration.
Support	User Representation	Interaction patterns that let users represent themselves and connect with each other, e.g. creating user profiles and following other users' contributions across the site. Depending on the implemented *Curation* class, this can have different implications.
	User & Content Reputation	Interaction patterns that present the reputation of content and users alike. This implies rating and starring favorite objects, but also leadership boards.

Within an interaction class, there are several options how to implement a certain feature, e.g. a social tagging functionality in the *Annotations* class. Not all of these options prove to be useful, so a means to express the complexity and quality of the interactions within a class is required. Consequently, a second dimension is added, which can describe the degree of the interactions of a certain class and links them to the access modes.

3.2 Degree and Complexity of Interactions

The classification of interactions is not yet adequate to compare cultural heritage information systems and their implemented features with one another. It lacks an essential ingredient which fuels the interactions and determines how sustainable and useful an offered interaction is. From the interaction classes alone, one cannot evaluate the implications and dependencies for improving access to cultural heritage content. Tasks such as adding a tag to a resource can be implemented in different ways, and it is often not obvious what intent different implementations have. For example, it makes a difference whether a tag is visible on the full view page of the object that was tagged or whether the tag is hidden in the user's account. In the first case, the tag can be searched and browsed; in the latter the tag is invisible to

other users. In one information system, interactions of the *Annotations* class might stimulate social collaboration among users; in another, social tagging is no more than an annotated list of bookmarks. To distinguish between these different degrees of interactions within a class, a second dimension is introduced which assesses the degree and complexity of interactions.

For interactions to become purposeful, they need to attract users to participate and revisit the system, in the best case also supporting the institution's mission. The degree as to how interactions achieve this can be illustrated in a second dimension of the framework. The degree of interactions can be considered as development stages, as each stage builds upon the preceding one. On each stage, the interactions become more complex, but also more purposeful, creating more access points for the material the user is interacting with. In general, institutions should strive for a higher degree of interactions as it grants more purpose to their interactions. Figure 8.2 shows a model of the interaction degrees and their influence on shaping different access points in the *Search*, *Browse* and *Engage* modes. In general, the more complex and user-oriented an information system is, the more interaction features it offers.

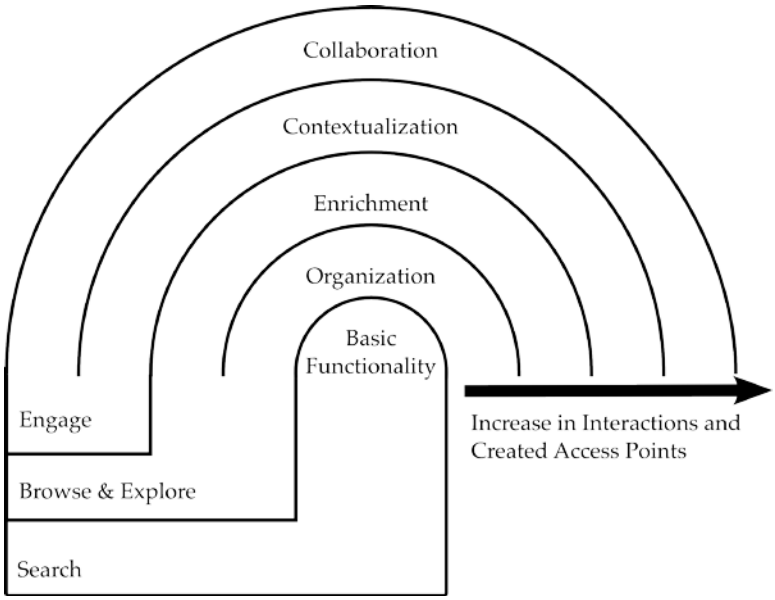

Figure 8.2: Second dimension of the framework in relation to different access modes.

Driven by the complexity of interactions, five development stages can be identified as described in Table 8.2. The different degrees of interactions are interwoven with the access modes offered to the material. The higher the degree of interaction, the higher the complexity of the possible interaction patterns and the access points created.

Table 8.2: Degrees of interactions and their descriptions with regard to the meta-classes.

Degree level	**Description**	**Access Mode**
Basic Functionality	For the *Content* classes, this degree is characterized by textual search as the most basic form of accessing content; in many cases in form of a simple search box. For the *Curation* classes, it means the basic module of a given feature is provided. For example, in the *Annotations* class, the user can add a tag or a comment. How this user addition is used and processed in the system is not part of this stage. For the *Support* classes, basic features for user representation, such as an account, or rating objects are present. On this level some structure might exist but it is not used.	Search
Organization	This degree level enables more complex interaction patterns. In the *Content* classes, this means to adhere to best practices in metadata standards such as the use of rich, domain-specific data models. An example of the benefits of more structured metadata is the provision of faceted search to reduce the number of results for a query. In the *Curation* classes, it means that curated content is stored in a structured way, thus allowing simple browsing and content exploration beyond search. For the *Support* classes, this often means that representation and reputation are made visible, creating recommendations for other users.	Search & Browse
Enrichment	Enrichment provides users with more entry points for retrieving and exploring particular content. It enables targeted browsing and search as ambiguous terms can be differentiated and named entities and the like identified. For the *Content* classes, it	Search & Browse

	can mean the provision of semantic enrichment within the metadata. In the *Curation* classes, any form of additional semantic information that is added to the content. In the *Support* classes, enrichment adds an additional layer of complexity which might be reached through the transparent exposure of user-object relationships.	
Contextualization	With contextualization, the Engage access point is activated, as contextualization can be a product of links between users and resources. The content gets embedded into richer and more diverse contexts. In the *Content* classes, this means that users contextualize cultural heritage objects and add their meaning and interpretations drawn from a number of different sources, also external ones, to them. In the *Curation* classes, the product of the interaction can be contextualized with linked data from third party sources. Users can embed their tags, exhibitions or uploaded objects into the broader perspective by adding them to a map or grouping them by different viewpoints, placing the resource into a broader context. For the *Support* classes, contextualization often means the creation of further pivot points for grouping data. At this stage, workflows become very complex and possible interactions increase. They get intermixed with the need to set the right incentive for the user to participate. The technical implications for implementing contextualization are manifold; user-generated content needs to be stored, upload functionalities provided and a quality assurance deployed. Cultural heritage information systems rarely offer contextualization through user-driven data.	Search & Browse & Engage
Collaboration	The most complex degree of an interaction class is collaboration. The focus is on working together in groups of like-minded people and sharing the product of the experience with a broader audience. For the *Content* classes, collaboration means working together on activities related to institutional or user objects. To implement this, complex group functionalities and rights management need to be set up. Furthermore, getting users to interact with	Search & Browse & Engage

	each other requires multifaceted user management and representation features. The *Curational* classes at this level are characterized by a social and collaborative effort in, for example, creating user exhibitions in groups. The *Support* classes assist the collaborative activities through simplifying communication and updates, e.g. follow features for other users. For the cultural heritage domain, this is still a long way off, but something cultural institutions should strive for.	

The combined dimensions presented above form a rich framework of interactions in cultural heritage information systems. It allows classifying interaction patterns by their goal within the system. Additionally, each interaction class can be complemented by an assessment of its degree and complexity. This dimension is closely related to the access modes offered by the system and the new access points, which are created through interactions. In general, interactions should focus on being purposeful for the institution and its users. This framework helps to understand the purpose a cultural heritage information system offers through its interactions from the users' point of view.

3.3 Evaluating Interactions

The framework is a tool for evaluating interactions in cultural heritage information systems. The best way to achieve this is visualizing the framework and mapping the interactions of each system or a group of systems to it. For a visual representation, the framework and its two dimensions are reflected in a radar model (Figure 8.3). The edges of the radial lines in the radar graph represent the interaction classes whereas the different rings represent the complexity and degree of interaction. With each outgoing ring from the center to the edge of the graph, the degree of interaction develops from *Basic Functionality* to *Collaboration*. The further away an interaction class is from the central point, the closer it is to support *Collaboration*, i.e. the largest degree of interaction a system can provide. Wider rings correspond to more access points that are created with more complex interactions. The more the

interaction is implemented towards *Collaboration,* the more access points are produced. Each interaction of an information system can be positioned on this grid to easily identify its nature.

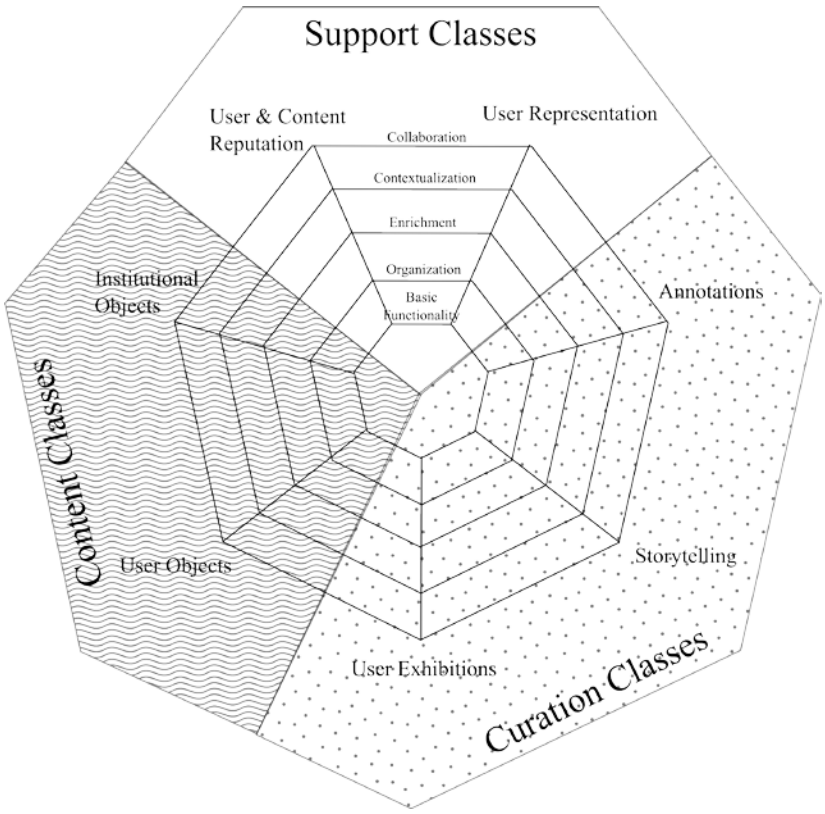

Figure 8.3: The framework visualized in a radar graph.

4. Evaluation of Cultural Heritage Aggregators

As a practical example, the following section will apply the framework for an assessment of interactions in one type of cultural heritage information systems, the aggregators. Aggregators accumulate digital cultural heritage material across institutions, languages or domains. A special focus lies on Europeana, the single access point for digital cultural material in Europe. It will be shown that the framework can be used to evaluate a group of systems or single systems and compare their interactions. For that, interactions were pinned to the framework to reveal characteristics and derive recommendations.[4]

[4] The codebook and coding form for pinning interactions to the framework can be found in the appendix of Stiller (2014).

Twelve aggregators were included in the analysis (Table 8.3). They either cover a single domain such as libraries, museums or archives or aggregate content across domains. Aggregators measure their success by the size of their collection and often display this on the homepage. Size and number of records differs considerably across the different systems. This is due to the different missions of the aggregators and what they want to achieve. The European Library, for example, joins together the collections of 48 national libraries and research libraries in Europe. Your Paintings, on the other side, is a project funded by the BBC and The Public Catalogue Foundation aggregating all oil paintings in the UK and making them accessible to the public through crowdsourced tags that describe these paintings.

Table 8.3: Sample of aggregators, their originating country and number of objects.

Name	**URL**[5]	**Country**	**Number of Objects**
Archives Portal Europe	http://www.archivesportaleurope.net/	ES	48 million records
ArtBabble	http://www.artbabble.org/	US	1,500 videos
DPLA	http://dp.la/	US	7.4 million records
Europeana	http://www.europeana.eu/	NL	32 million records
Gallica	http://gallica.bnf.fr/	FR	3 million records
Google Art Project	http://www.googleartproject.com/	US	70,000 artworks
HathiTrust	http://www.hathitrust.org/	US	11 million volumes
Project Gutenberg	http://www.gutenberg.org/	US	45.000 books

[5] All URLs were last accessed on Jul 29, 2014.

Smithsonian Collections Search Center	http://collections.si.edu/search/index.htm	US	8.6 million records
The European Library	http://www.theeuropeanlibrary.org/	NL	22 million objects, 150 million records
World Digital Library	http://www.wdl.org/	US	10,000 records
Your Paintings	http://www.bbc.co.uk/arts/yourpaintings/	UK	210.000 paintings

4.1 Case Study I: Evaluating Aggregators

Figure 8.4 shows the percentage of systems within the sample of aggregators that implemented an interaction class to a certain degree. In general, it can be observed that aggregators are focused on improving and standardizing metadata embedding additional information to it. As aggregators are not affiliated with a single physical institution but rather act as independent digital libraries, they need to offer innovative ways to discover content. This sets them apart from the online presence of other memory institutions and ensures that providers are willing to contribute content. Their main task is driven by the challenges that arise when aggregating content from different sources. Moreover, they target their services toward offering customized user experiences although the social part does not play such a big role here. Their services are not focused on user collaboration. Nevertheless, they strive for meaningful representation of their material.

	Basic Functionality	Organization	Enrichment	Contextualization	Collaboration
Institutional Objects	100%	100%	92%	17%	0
User Objects	8%	0	0	0	0
Annotations	50%	17%	8%	8%	0
User Exhibitions	58%	25%	17%	8%	0
Storytelling	0	0	0	0	0
User Representation	50%	0	0	0	0
User & Content Reputation	17%	8%	0	0	0

Figure 8.4: Percentage of systems among aggregators that provide interactions per class and degree (the darker the cell the more systems provide interactions in this class).

As the aggregated material is often very heterogeneous, aggregators need to solve problems of metadata standardization and display before focusing on user interactions. Their unifying goal is to offer users a single access point that refers to the locations where the digital object resides. Most aggregators are not hosting the digital objects themselves but only their metadata records; digital objects stay with the provider. They redirect the traffic to the content provider making him more visible in return. They legitimate their funding and hereby their existence through discovery tools and means which integrate heterogeneous data. In the following section, the meta-classes and their characteristics within the sample of aggregators systems will be discussed.

Content Interaction Classes

For aggregators, the interaction class *Institutional Objects* is shaped by their tools for content discovery and browsing (degree: *Enrichment)*. In most cases (eight in the sample), aggregators do not have the digital objects to offer deep-zoom functionalities or other features that would require the computational analysis of the underlying content. They focus on discovery tools that built on the metadata of the artifacts leveraging fields for coverage and date. Almost all systems allow the user to discover data through geospatial or timeline browsing.

Aggregators are focused on providing a rich search experience; they need to guide the users to huge amounts of data providing them with powerful tools to refine search results. All of them offer advanced search and facets to refine the search results. Here, they are not as innovative as for example museums and mostly rely on the information in the metadata to construct the facets.

Curation Interaction Classes

Aggregators do hardly implement interactions from the *Curation* classes. They often do not have the digital objects and only host the metadata. Their efforts concentrate on making the content more retrievable with search and browsing functionalities. Many have user exhibitions implemented and half of the systems allow the users to add annotations. Some aggregators implemented tagging in the personal space of users allowing them to tag saved items for later revisits (e.g. Europeana and Gallica). These annotations are not intended to be social or shared publicly but rather have the function to organize the user's information space.

Out of the eight systems that offer interactions in the *User Exhibitions* class, six let users only save searches and favorite items for later revisits (degree: *Basic Functionality*). One system allows the user additionally to share these personalized lists (degree: *Organization*). In these cases, exhibitions or collections serve the research purpose of the user. Saving searches and revisiting them, same as frequenting a list of saved items, is targeted towards

users that are researching specific areas of the collection. Interactions in the *Storytelling* class are not implemented in any of the aggregator systems.

Aggregators implement user curation on a limited scale. One reason is that they have only access to the metadata and do not have rich digital objects. One exception in this group is the Google Art Project that lets users contextualize their user exhibitions and the items in it. They can afford this type of interaction as they have high-resolution images of the art works allowing the user to zoom in and annotate certain parts of the objects.

Support Interaction Classes

Half of the aggregators offer a user account where users can customize their experience and save favorite items and searches. In general, the user account is not used to add a social aspect to the user experience. None of the user accounts let the user have a public profile or transparently link the users to activities they have taken within a given system. This might be due to the prevailing uncertainty how a successful social experience with aggregated content might look like. There is the possibility to save searches and items. This feature accommodates the workflow of researchers who often construct complex queries and might need to revisit them again. With regard to the public user, the purpose of such a feature needs to be challenged. The user accounts in aggregator systems often do not fulfill a specific purpose and are therefore rarely used.

To summarize, for aggregators, engagement plays only a marginal role. They are characterized by the provision of personalized experiences with the content rather than collaborative ones. The user curation of objects is limited to the personal space and not for public consumption.

4.2 Case Study II: Evaluating Europeana

One aggregator that will be further evaluated is Europeana. The Europeana portal offers a single access point to the digitized cultural heritage coming from museums, archives, libraries and galleries in Europe. It is an aggregator

and provides access to the metadata of the objects and a thumbnail and enables the user to go to the hosting institution accessing the digital object in full size or the full-text of the required document.

Presently, Europeana aggregates over 32 million objects[6] coming from more than 2000 different European institutions. This aggregation of digital cultural heritage data is unique in its scale. Not only unifies it millions of heterogeneous digital cultural objects but it is also characterized by European-wide collaboration of providers, researchers and other stakeholders which want to enable access to Europe's cultural heritage. Europeana fosters research in the area of digital cultural heritage and is pioneering new approaches to improve access, for example the contextualization of the material by semantic enrichment of the metadata (Isaac, 2013).

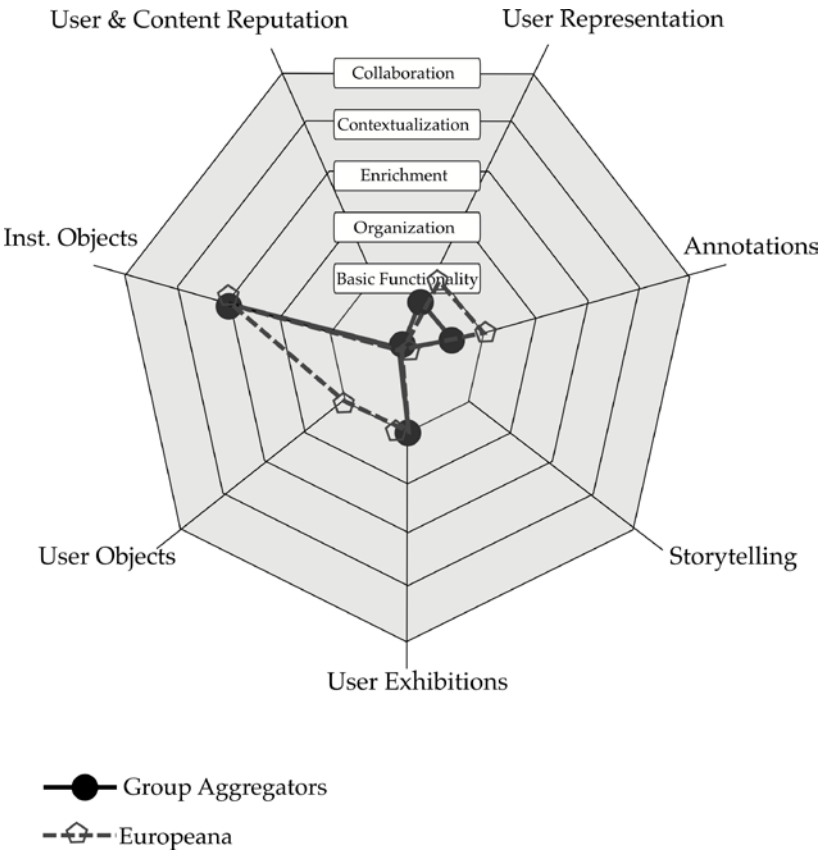

Figure 8.5: Radar graph of Europeana and all aggregators in comparison.

[6]32,273,993 on Jul 29, 2014

A visualization of Europeana's interactions in the framework compared to the ones of the Aggregators group can be found in Figure 8.5. For none of the interaction classes, Europeana reaches more than the *Enrichment* level. The biggest task it is facing is the aggregation of heterogeneous data created without cross-institutional standards. This data needs to be homogenized to offer equal access to all objects and ensure transparency. Therefore, Europeana pays particular attention to aggregating the data while presentation display and engagement is of secondary concern. This is shown in the degrees of their interaction classes. Interactions in the *Institutional Objects* (Degree: *Enrichment*) are higher developed than in the *Curation* classes where the degree does not exceed *Basic Functionality.*

Europeana offers search and browsing functionalities for its users to find and discover *Institutional Objects* and *User Objects*. For example, it has curated exhibitions that highlight parts of the collection and tell a story about a specific topic. Furthermore, the standardized metadata fields are used as facets that allow the user to refine search results. The fact that Europeana enriches its metadata with external multilingual vocabulary allows the user to find more objects even if they are in languages users do not understand. Europeana strives for the integration of objects contributed by users. The different satellite projects funded by the EU, which contribute technology, content and expertise to Europeana, aggregate user content and find ways in engaging the users with cultural heritage. Several storytelling platforms targeting different themes were created which let users tell their stories and upload their material (e.g. Europeana 1914-1918[7]). Some of this content finds its way into Europeana and there, it can be searched by default with the opportunity to exclude it from the results via a tick box. Search is enabled for the user objects but no upload functionality is offered, so the degree of *Basic Functionality* is reached in the *User Objects* class. User contributed objects serve as additional content source for Europeana but they only aggregate but do not create this content on their platform. In this class, Europeana differs from the rest of the aggregators, as they normally do not provide the search of user objects.

[7] http://www.europeana1914-1918.eu

In the *User Curation* section of the interaction classes, Europeana is rather weak. One reason is that Europeana does not have the original digital objects and can only present thumbnails that limit interactions. The users can annotate objects and save favorite items but they are hidden in the user's private area and these features have no social component associated with it. Therefore, the level for *Annotations* and *User Exhibitions* is the *Basic Functionality.* These low levels can be explained by the interactions in the *Support* interaction classes. Europeana offers a user account which falls into the class *User Representation* but it has no other functionality than to set preferences and to edit saved lists of objects and tags. This private area called 'my Europeana' stores user data and has no social component; thus users cannot present themselves in a profile or similar. This equates to the degree of *Basic Functionality* in the class *User Representation*. Interactions in the classes *Storytelling* and *User and Content Reputation* are not implemented in Europeana.

Europeana concentrates on the aggregation of data and access provision on a large scale. Therefore, the implementation of curational activities is on a low level. Several problems need to be solved before these curational activities can be developed more. For example, there is yet no way in feeding changes in the metadata back to the source data as Europeana does not own the data.

Although Europeana does not aggregate the original source data, there are ways to improve user interactions and construct better models to serve users and institutions alike. First, interactions within the *Curation* interaction classes, i.e. *User Exhibitions* and *Annotations* should become social, so more people can profit from other users' tags and saved searches. A first step here is to make user annotations publicly visible or allow users to share them with likeminded people in social networks or within Europeana. The other necessary change is to improve the tagging feature within the *Annotations* class. For now, each tag creates one entity consisting of one digital object with one or more tags. Adding another tag to the same object creates a separated object that is not related to the previous one. This construction

makes it impossible for the users to manage their tags and the tagged objects. This also limits the use of the tags for other users if they might become part of the metadata at some point.

Furthermore, the existing user accounts, interaction class *User Representation*, can be used to personalize the users' experiences and enable them to set preferences which influence the search experience. Multilingual preferences can be offered which would allow searching a collection in a specific language or automatically translating all results to the users' preferred ones.

As aggregator, Europeana should focus its efforts on improving the interactions in the *Institutional Object* class by embedding the content into broader contexts and allow users to experience it from different perspectives. Aggregators display the objects of several hundreds or even thousands of individual institutions. This offers the opportunity to display objects from different viewpoints and create relationships an individual institution cannot establish. Due to the thematic heterogeneity of the providers, aggregators can highlight the different dimensions of one topic. For that, it is essential to further enrich the metadata[8] to be able to regroup objects based on other characteristics than their creator, title or providing institutions. The most valuable asset of aggregators is the data they are providing, therefore, the core task is the accessibility of these objects creating links between them that would have not been possible in the providing institution.

5. Conclusion

This chapter presented a framework to evaluate, discuss and assess implemented interactions in cultural heritage information systems. It combined the interactions with modes of access provided for the material and argued

[8] A study on the semantic and multilingual enrichments of Europeana has shown that they can be misleading and erroneous if no enrichment strategy is applied (Olensky, 2012).

that collaborative interactions will lead to the creation of more access points. The framework helps stakeholders of information systems in the cultural heritage domain to identify weaknesses in their provided interactions and define points were an improvement strategy could be effective. The framework is a holistic approach to understand interactions offered by the system and utilized by users and their relation to access modes Search, Browse and Engage. In general, several points can be concluded from the development of the framework:

1. The content drives the type of curational activities provided by the institution.

2. Curational activities develop from individual participation to group collaboration.

3. The more collaborative the curational activities are, the more users are engaged and new access points for the content are established.

4. Additional access points are in turn leveraged through Search, Browse and Engage.

It is not only necessary to provide certain features and consequently interactions but be aware of their influence on the access modes. Each interaction can provide more access points, which can be leveraged by other users to access the content. The more these considerations affect the system design, the more likely a system is going to offer purposeful interactions – benefitting users and institutions alike.

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